University of Nottingham
Nanoscale and Microscale Research Centre

Particle sizing suite

Particle sizing is the characterisation of the size distribution (size range and/or mean size) and number of particles in a sample. It can be applied to solid materials, suspensions, emulsions and aerosols. Techniques include laser diffraction (LD), dynamic light scattering (DLS), nanoparticle tracking analysis (NTA), Taylor dispersion analysis (TDA), differential sedimentation (disc centrifuge (DC)) and simpler sieving and separation methods. Method selection will depend on the size range of the particles, the nature of the sample, the capabilities and limitations of the analytical method, the information and the sample throughput desired.

Capabilities

- Particle size determination
- Solution / suspension concentration
- Aggregate detection
- Assessment of colloidal stability
- Zeta potential analysis

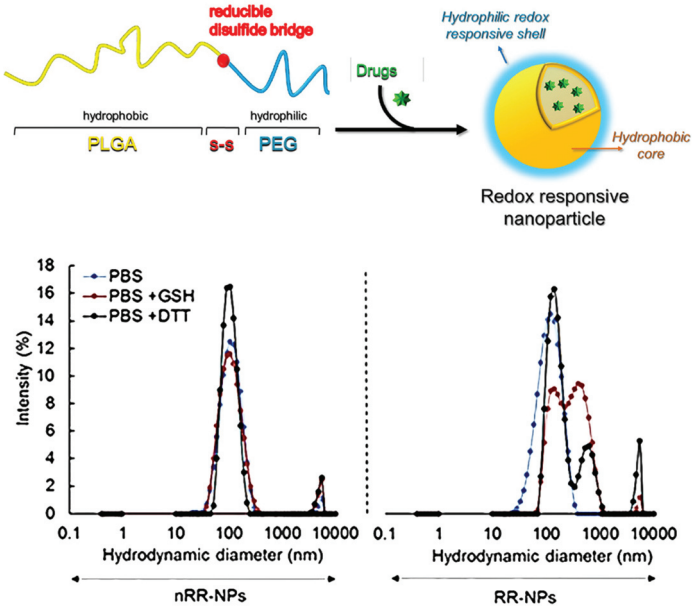
Typical applications

- Product performance; Quality control in different industries (i.e. pharmaceutical, chemical, food and energy)
- Process performance; Determination of efficiency of manufacturing process (i.e. where milling or grinding is used)
- Research and development (i.e. nanoparticle characterisation studies, study of surface modifications)

Size and zeta potential characterisation of nanoparticles designed for drug delivery

An important step in the design of drug carrier nanoparticles is characterisation of particle size and surface change in appropriate environments. Redox-responsive nanoparticles (RR-NPs) were synthesised for drug delivery into lung cancer tumour cells. The RR-NPs were designed to change surface properties when entering tumour microenvironments, which would in turn enhance their cell internalisation and delivery of drug cargo. Characterisation using a Zetasizer Nano ZS instrument of both RR-NPs and non-RR-NPs showed similar properties including hydrodynamic diameter (120 nm), low polydispersity, and high negative zeta potential values. However, size distribution curves showed lower colloidal stability of RR-NPs under in vitro reducing conditions.

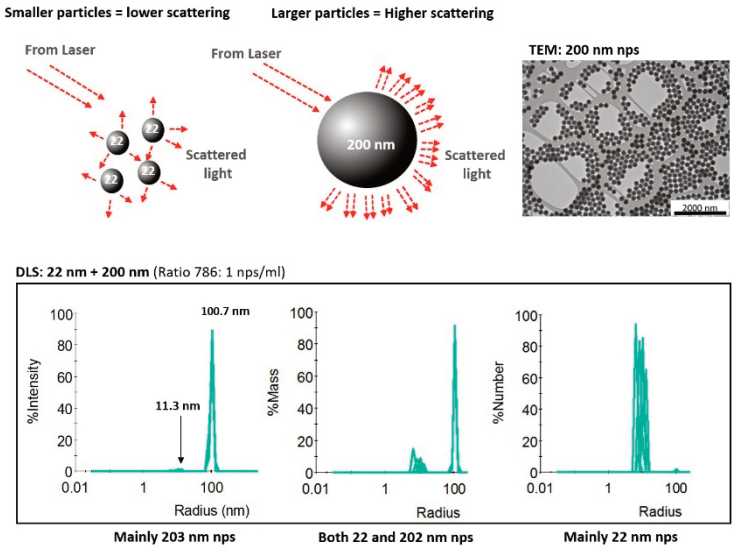
Claudia Conte, Francesca Mastrotto, Vincenzo Taresco, Aleksandra Tchoryk, Fabiana Quaglia, Snjezana Stolnik, and Cameron Alexander. *Journal of Controlled Release*, 277 (2018), 35-45.



Size analysis of a mixture of polystyrene nanoparticles

DLS measurements provide an intensity distribution of particle sizes that can also be converted to volume and number distributions. Comparing these distributions helps understand mixed populations, where larger particles scatter more light and cause variations in the distributions. A DynaPro Plate Reader II instrument was used to characterize a mixture of 22 and 200 nm polystyrene nanoparticles and found from the number distribution the 22 nm to be the major population in the mixture.

Data courtesy of Dr Marion Limo, nmRC, Nottingham.



Our facilities

DynaPro Plate Reader II dynamic light scattering instrument capable of measuring between 1 nm to 2 um hydrodynamic diameter and providing information of polydispersity.

Zetasizer Nano ZS for electrophoretic mobility of proteins, zeta potential of nanoparticles colloids.

Viscotek 802 dynamic light scattering which can be operated between 4 and 60 °C.

LA-960 Laser Particle Size Analyser that measures sizes between 10 nm and 5000 µm from both wet and dry samples such as powders, gels, and creams.

Zetaview NTA capable of measuring hydrodynamic particle size, zeta potential, concentration, and fluorescence.

Electron Microscopy suite including scanning and transmission electron microscopy for microscale and nanoscale particle sizing down to 1-2 nm sized features.

Find out how particle analysis could help with your applications, designs or solutions:
nmrcenquiries@nottingham.ac.uk | +44 (0)115 951 5046
nottingham.ac.uk/nmrc-commercial